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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,388	12/18/2001	Hiroki Nagashima	13854	6482

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EXAMINER	
TUCKER, WESLEY J	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 04/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/017,388	NAGASHIMA, HIROKI	
	Examiner	Art Unit	
	Wes Tucker	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 December 2001* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendments and Arguments

1. Applicant's response to the last Office Action, filed Jan 28th, 2005, has been entered and made of record.

2. Applicant has not amended any claims. Applicant has added new claim 21.

3. Applicant's arguments have been fully considered but are not persuasive for at least the following reasons.

4. With regard to claim 1, Applicant argues that the reference of Nakagawa does not disclose the image interpolation as claimed in claim 1. Applicant submits that Nakagawa performs interpolation between images using a different approach than Applicant's claimed invention. Nakagawa performs interpolation, using images of a 3D object from different viewpoints and interpolating between the viewpoints using angles and a trajectory of points. Applicant's present invention interpolates an image by acquiring two image pairs on two different axis and interpolating to generate an intermediate frame or image. Applicant also argues that Nakagawa does not disclose or teach the feature of "acquiring a second image pair, comprising two key frames, and second corresponding data point between the two key frames of the second image pair" as claimed. Examiner points to the discussion of the previous rejection in regard to this step in claim 1. Nakagawa discloses a method wherein known points of view of a three

dimensional object are interpolated between to generate interpolated images of the object (column 3, line 65-column 4, line 16). It is therefore understood that a first pair of images are interpolated between to generate a first interpolated image or data for an interpolated image then another pair are interpolated between to generate another interpolated image or data for an interpolated image and then the two new interpolated images are interpolated between.

Applicant also argues that Nakagawa does not disclose the feature claimed in claim 7 in which "the key frames used for interpolating are photographed respectively from a same view point but at different times." Examiner submits that the motion of 3D object is determined according to multiple frames of the image (column 4, lines 35-50). Here it is understood that the key frames involve the object in motion, which is interpreted to involve images at different moments in time. Examiner submits that the reference of Nakagawa broadly interpreted still reads on the present invention as claimed. Therefore the rejection is maintained and is accordingly made final.

Claim Rejections - 35 USC § 112

5. Claim 21 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In the Applicant's remarks on page 13, Applicant states that the references do not teach or suggest the advance calculation of

corresponding point files as described at page 65, lines 20 to 26 in the specification and claimed in claim 21. However Examiner submits that the advance calculation of point files is not taught on page 65, lines 20-26 or anywhere else in the specification. Also it is unclear how it is even possible to have first corresponding point data and second corresponding point data calculated in advance of acquiring or at least knowing the respective image pairs. Clarification is required as to what the calculation of first and second corresponding point data is in advance of and how it is possible to calculate point data between image pairs in advance of acquiring the image pairs.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-11 and 13-20 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,831,619 to Nakagawa et al.

8. With regard to claim 1, Nakagawa discloses an image interpolation method, comprising acquiring a first image pair, comprising two key frames and first

corresponding point data between the two key frames of the first image pair (column 2, line 61-column 3, line 22). Nakagawa discloses how multiple images are taken of an object from multiple viewpoints and those viewpoints are then interpolated to create an image of the object from a specified viewpoint.

Nakagawa further discloses acquiring a second image pair, comprising two key frames, and second corresponding point data between two frames of the second image pair (column 2, line 61-column 3, line 22). It is understood that Nakagawa discloses determining an image of the object from any possible viewpoint by interpolating between known viewpoints. The multiple known viewpoints are interpreted as being grouped into pairs that are then interpolated between.

Nakagawa further discloses generating an intermediate frame by interpolation, wherein the interpolation utilizes positional relations of a first axis and a second axis and the first corresponding point data and the second corresponding point data (column 3, line 65-column 4, line 16). Nakagawa discloses a method in which known points of view of a three-dimensional object are known and other intermediate images of the object are determined by interpolation. It is interpreted that Nakagawa would determine the viewpoint in between four different viewpoints or two axes by interpolating between first one pair of images and then the other pair and then interpolating between the two interpolated images.

Nakagawa further discloses the first axis being determined temporally or spatially between the second axis being determined temporally or spatially between the two key frames of the second image pair (column 4, lines 16-40). Nakagawa discloses

interpolating between spatial viewpoints and also discloses interpolating between views of an object in motion or a temporal interpolation (column 4, lines 35-50).

The second axis being determined temporally or spatially between the two key frames key frames of the second image pair (column 4, lines 16-40). Nakagawa discloses interpolating between spatial viewpoints and also discloses interpolating between views of an object in motion or a temporal interpolation (column 4, lines 35-50).

9. With regard to claim 2, Nakagawa discloses a method wherein the first image pair and the second image pair are determined so that the first axis and the second axis do not lie on the same line (column 3, lines 40-45). Nakagawa discloses interpolating between known points on curves or ellipses around a 3-D object and the different curves are interpreted as different axes.

10. With regard to claim 3, Nakagawa discloses a method wherein one of the two key frames in the first image pair and one of the two key frames in the second image pair are common, and the interpolation utilizes positional relations based on a triangle having the first axis and the second axis as two sides thereof (column 3, lines 40-45). Nakagawa discloses interpolating between known points on curves or ellipses around a 3-D object and the different curves are interpreted as different axes. It is understood that the interpolation axes can fall anywhere on the sphere and can intersect forming a triangle for interpolating.

11. With regard to claim 4, Nakagawa discloses a method wherein the first image pair and any of the two key frames in the second image pair do not have any key frames in use, and the interpolation utilizes positional relations based on a quadrilateral having the first axis and the second axis as two sides opposite to each other (column 3, line 65-column 4, line 16). Nakagawa discloses a method in which known points of view of a three-dimensional object are known and other intermediate images of the object are determined by interpolation. It is interpreted that Nakagawa would determine the viewpoint in between four different viewpoints or two axes by interpolating between first one pair of images and then the other pair and then interpolating between the two interpolated images.

12. With regard to claim 5, Nakagawa discloses a method and apparatus that interpolates between object views or images according to already known viewpoints or images (column 2, line 61-column 3, line 22). Therefore it is understood that the apparatus of Nakagawa is capable of interpolating according to any known images and at any ratio between known viewpoints and the corresponding axes as desired to find any image for a viewpoint (column 8, lines 53-58).

13. With regard to claim 6, Nakagawa discloses a method further comprising acquiring a positional relation between the intermediate frame, the two key frames of the first image pair and the two key frames of the second image pair, wherein the interpolation is performed based on said positional relation (column 3, line 65-column 4,

line 16). Nakagawa discloses a method in which known points of view of a three-dimensional object are known and other intermediate images of the object are determined by interpolation. In performing interpolation Nakagawa bases the operation on positional relation between points (column 3, lines 5-22).

14. With regard to claim 7, Nakagawa discloses a method wherein the two key frames of the first image pair and the two key frames of the second image pair are images photographed respectively from a same view point but at different times (column 4, lines 35-50). Nakagawa discloses how the motion of a 3D object is determined according to multiple frames of the image.

15. With regard to claim 8, Nakagawa discloses a method wherein the two key frames of the first image pair and the two key frames of the second image pair are images photographed respectively from different viewpoints (column 3, line 65-column 4, line 16).

16. With regard to claim 9, Nakagawa discloses an image interpolating method, comprising computing a matching between a first image pair comprised of two key frames, and detecting first corresponding point data between the two key frames of the first image pair (column 2, line 61-column 3, line 22). Nakagawa discloses how multiple images are taken of an object from multiple viewpoints and those viewpoints are then interpolated to create an image of the object from a specified viewpoint.

Nakagawa further discloses computing a matching between second image pair comprised key frames, and detecting second corresponding point data between the two key frames of second image pair (column 2, line 61-column 3, line 22). It is understood that Nakagawa discloses determining an image of the object from any possible viewpoint by interpolating between known viewpoints. The multiple known viewpoints are interpreted as being grouped into pairs that are then interpolated between.

Nakagawa further discloses generating an intermediate frame by interpolation, utilizing positional relations of a first axis and a second axis, the first corresponding point data and the second corresponding point data (column 3, line 65-column 4, line 16). Nakagawa discloses a method in which known points of view of a three-dimensional object are known and other intermediate images of the object are determined by interpolation. It is interpreted that Nakagawa would determine the viewpoint in between four different viewpoints or two axes by interpolating between first one pair of images and then the other pair and then interpolating between the two interpolated images.

Nakagawa further discloses wherein the first axis determined temporally or spatially between the two key frames of the first image pair (column 4, lines 16-40). Nakagawa discloses interpolating between spatial viewpoints and also discloses interpolating between views of an object in motion or a temporal interpolation (column 4, lines 35-50).

Nakagawa further discloses that the second axis is determined temporally or spatially between two key frames of the first image pair (column 4, lines 16-40).

Nakagawa discloses interpolating between spatial viewpoints and also discloses interpolating between views of an object in motion or a temporal interpolation (column 4, lines 35-50).

17. With regard to claim 10, Nakagawa discloses a method wherein said matching is computed pixel by pixel between the two key frames (column 5, lines 45-50). Nakagawa discloses that interpolation is performed on the images of the 3D object using identical points on the object and the images stored in memory. This is interpreted as performing matching on a pixel basis.

18. With regard to claim 11, Nakagawa discloses wherein said matching is computed pixel by pixel based on correspondence between critical points detected through respective two-dimensional searches of the two key frames (column 5, lines 45-50). Nakagawa discloses that interpolation is performed on the images of the 3D object using identical points on the object and the images stored in memory. This is interpreted as performing matching on a pixel basis and the identical points are the critical points in each of the key frames.

19. With regard to claim 13, the discussion of claim applies. Nakagawa discloses an image interpolation apparatus for use with the method (column 1, line 63-column 2, line 17).

20. With regard to claim 14, Nakagawa discloses a method and apparatus that interpolates between object views or images according to already known viewpoints or images (column 2, line 61-column 3, line 22). Therefore it is understood that the apparatus of Nakagawa is capable of interpolating according to any known images and at any ratio between known viewpoints and the corresponding axes as desired to find any image for a viewpoint (column 8, lines 53-58).

21. With regard to claim 15, Nakagawa discloses an apparatus further comprising a matching processor, which generates the corresponding point data (column 5, lines 45-55). The identical points disclosed by Nakagawa are considered matched and they are considered matched by a processor.

22. With regard to claim 16, Nakagawa discloses an apparatus wherein the two key frames of the first image pair and the two key images of the second image pair are images photographed respectively from a same viewpoint but at different times (column 4, lines 35-50). Nakagawa discloses how the motion of a 3D object is determined according to multiple frames of the image.

23. With regard to claim 17, Nakagawa discloses an apparatus wherein the two key frames of the first image pair and the two key frames of the second image pair are images photographed respectively from different viewpoints (column 3, line 65-column 4, line 16).

24. With regard to claim 18, Nakagawa discloses an apparatus further comprising a user interface by which to input externally a specification regarding a temporal or spatial position of the intermediate frame to be generated (column 2, lines 1-17). Nakagawa discloses a specified desired viewpoint and it is understood that the desired viewpoint must be specified by some external means either programmed or manually.

25. With regard to claim 19, the discussions of claim 1 and 18 apply.

26. With regard to claim 20, the discussions of claim 1 and 13 apply. Nakagawa's apparatus and method are considered executed with a computer program (Fig.1).

27. With regard to claim 21, Nakagawa discloses a method according to claim 1, wherein said first corresponding point data and said second point data have been calculated in advance of said acquiring (

Claim Rejections - 35 USC § 103

28. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

29. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,831,619 to Nakagawa and U.S. Patent 6,018,592 to Shinagawa et al.

30. With regard to claim 12, Nakagawa discloses a method according to claim 11 and also discloses performing image matching, but does not disclose multiresolutionizing the key frames. Shinagawa discloses multiresolutionizing the two key frames by respectively extracting the critical points (column 3, lines 35-54).

Shinagawa further discloses performing a pixel-by-pixel matching computation on the two key frames, at same resolution levels (column 3, lines 48-54).

Shinagawa further discloses acquiring a pixel-by-pixel correspondence relation at a finest level of resolution while inheriting a result of a pixel-by-pixel matching computation in a different resolution level (column 3, lines 55-65).

Shinagawa teaches that this method overcomes matching problems such as blurring of the image at lowered resolutions. Therefore the critical point is determined first and then the resolution is lowered in order to maintain matching of critical structures in the image (column 3, lines 1-34). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use the multiresolutionizing of

Shinagawa for use in the image matching of Nakagawa in order to overcome problems with image matching such as blurring in low resolution images.

Prior Art

Other prior art considered relevant, but not relied upon is as follows:

U.S. Patent 5,613,048 to Chen et al. is a method for determining images of a three dimensional object in between known images of the object.

U.S. Patent 6,222,551 to Schneider et al. is a method for creating a three dimensional object view manipulation through use of projections of the object.

U.S. Patent 6,525,731 to Suits et al. is a system for providing 3D views of an object for manipulation.

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in the Office Action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is 703-305-6700. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wes Tucker

4-21-05

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